

# Claims

[c1] What is claimed is:

1. A variable drag projectile stabilizer for limiting a flight range of a training projectile, comprising:

a cowling;

a plurality of struts for supporting the cowling;

a plurality of ducts formed by the cowling and the struts;

a plurality of angled surfaces on each of the struts for introducing a first set of oblique shock waves in a supersonic flow of air through the ducts;

an angled interior surface of the cowling for introducing a second set of oblique shock waves in the supersonic flow of air through the ducts;

wherein at launch of the training projectile, interaction of the first set of oblique shock waves with the second set of oblique shock waves permits supersonic flow through the ducts resulting in a relatively low aerodynamic drag on the training projectile;

wherein as the training projectile decreases in velocity the first set of oblique shock waves and the second set of oblique shock waves increase in interaction and the supersonic flow of air through the ducts is choked, causing an increase in aerodynamic drag

to the training projectile;  
wherein the small amount of drag allows the training projectile to closely match a flight characteristic of a corresponding service projectile; and  
wherein the large amount of drag limits the flight range of the training projectile to a predetermined distance.

- [c2] 2. The variable drag projectile stabilizer of claim 1, wherein the cowling comprises a cowling leading edge and a cowling trailing edge.
- [c3] 3. The variable drag projectile stabilizer of claim 1, wherein the struts comprise a plurality of strut leading edges and a plurality of strut trailing edges.
- [c4] 4. The variable drag projectile stabilizer of claim 3, wherein the cowling leading edge extends forward of the strut leading edges.
- [c5] 5. The variable drag projectile stabilizer of claim 3, wherein the strut leading edges extend forward of the cowling leading edge.
- [c6] 6. The variable drag projectile stabilizer of claim 1, wherein a length of the cowling is approximately 2.5 inches.

- [c7] 7. The variable drag projectile stabilizer of claim 1, wherein the length of the cowling may range between approximately 1.0 inch to 4.0 inches.
- [c8] 8. The variable drag projectile stabilizer of claim 1, wherein the diameter of the cowling is approximately 3.75 inches.
- [c9] 9. The variable drag projectile stabilizer of claim 1, wherein the diameter of the cowling may range between approximately 3.0 inches to 5.0 inches.
- [c10] 10. The variable drag projectile stabilizer of claim 1, wherein the angled surfaces on each of the struts are angled at a strut surface angle of approximately 1 degree with respect to a longitudinal axis of the training projectile.
- [c11] 11. The variable drag projectile stabilizer of claim 1, wherein the strut surface angle may range between approximately 1.0 degree to 5.0 degrees with respect to the longitudinal axis of the training projectile.
- [c12] 12. The variable drag projectile stabilizer of claim 1, wherein the angled interior surface of the cowling is angled at an interior surface angle of approximately 1 degree with respect to a longitudinal axis of the training projectile.

- [c13] 13. The variable drag projectile stabilizer of claim 1, wherein the angled interior surface angle may range between approximately 1.0 degree to 5.0 degrees with respect to the longitudinal axis of the training projectile.
- [c14] 14. The variable drag projectile stabilizer of claim 1, wherein the struts are symmetric with respect to the longitudinal axis of the training projectile.
- [c15] 15. The variable drag projectile stabilizer of claim 1, wherein an asymmetry in the struts with respect to the longitudinal axis of the training projectile is provided to induce spin in the training projectile during a flight of the training projectile.
- [c16] 16. The variable drag projectile stabilizer of claim 15, wherein the asymmetry in the struts is provided by angling the struts with respect to the longitudinal axis of the training projectile such that the strut surface angle on a first angled surface of the struts is less than the strut surface angle on a second angled surface of the struts.
- [c17] 17. The variable drag projectile stabilizer of claim 15, wherein the asymmetry in the struts is provided by modifying a trailing edge of one of the angled surfaces of the struts.

[c18] 18. The variable drag projectile stabilizer of claim 15, wherein the asymmetry in the struts is provided by modifying a leading edge of one of the angled surfaces of the struts.

[c19] 19. The variable drag projectile stabilizer of claim 1, wherein the cowling comprises a plurality of strakes on an exterior surface of the cowling to introduce a spin to the training projectile during the flight of the training projectile.

[c20] 20. The variable drag projectile stabilizer of claim 1, wherein the diameter of the cowling is sized less than a bore of a gun that launches the training projectile to equalize an inside pressure on the cowling and an outside pressure on the cowling from a plurality of gun gases that flow through the ducts.

21. The variable drag projectile stabilizer of claim 1, wherein the trailing edge of the cowling is scalloped to allow the gun gases to quickly escape from the ducts, further equalizing the inside pressure on the cowling and the outside pressure on the cowling from the gun gases that flow through the ducts.